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09/765,754	01/19/2001	Sae-Young Chung	2-19	8897

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EXAMINER	
FAN, CHIEH M	
ART UNIT	PAPER NUMBER
2634	

DATE MAILED: 03/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/765,754	Applicant(s) CHUNG ET AL.	
	Examiner Chieh M Fan	Art Unit 2634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 January 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 January 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

In particular, the abstract of the present application contains the words

"disclosed" (line 2), which should be changed.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-4, 6-8, 16-19, 23 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Fazel et al. (U.S. Patent No. 5,323,424, "Fazel" hereinafter).

Regarding claim 1, Fazel teaches a method for multilevel coding of a stream of information bits in a communication system, the method comprising the steps of

separating the stream of information bits into a plurality of different portions (30 in Fig. 3);

associating each of the portions of the information bits with one of a plurality of levels (D_1, D_2, ... D_m in Fig. 3);

applying at least one code (31_1, 31_2, ..., 31_M in Fig. 3) to the portion of the information bits of each level in a designated subset of the plurality of levels (D_1, D_2, ... D_M in Fig. 3), such that the portions of the information bits for one or more levels in the designated subset are coded while the portions of the information bits for one or more levels not in the designated subset (D_{M+1}, ..., D_m in Fig. 3) are uncoded;

utilizing both the coded portions of the information bits and the uncoded portions of the information bits to select modulation symbols for transmission in the system (32 in Fig. 3).

Regarding claim 2, the stream of information bits comprises a stream of source-coded information bits (11 in Fig. 1).

Regarding claim 3, there are a total of m of the levels, and the modulation symbols are selected from a signal set of a 2^m modulation constellation (col. 7, lines 29-33).

Regarding claim 4, the at least one code comprises a block code (col. 6, line 63).

Regarding claim 6, the at least one code comprises a cyclic redundancy check (CRC) code (col. 7, line 36)

Regarding claim 7, there are a total of m of the levels (D_1, D_2, ... D_m in Fig. 3), arranged from a lowest level to a highest level, and the designated subset of levels (D_1, D_2, ... D_M in Fig. 3) includes at least the lowest level.

Regarding claim 8, the method of claim 1 wherein there are a total of m of the levels (D_1, D_2, ... D_m in Fig. 3), arranged from a lowest level to a highest level, and the designated subset includes a series of i_{max} adjacent levels (D_1, D_2, ... D_M in Fig. 3) beginning with the lowest level, where i_{max} is less than m (as shown in Fig. 3 $M < m$).

Regarding claim 16, the stream of information bits comprises at least one frame of information bits, and each of the portions of the stream of information bits comprises a different class of bits within the at least one frame, and wherein the at least one code is selected so as to provide different amounts of error protection for at least a subset of the different classes of bits (col. 7, lines 22-23, also note that the information bits are HDTV signal samples, see col. 5, line 39).

Regarding claims 17 and 18, since the information bits are HDTV signal samples, there are inherently a plurality of frames of information bits.

Regarding claim 19, Fazel further teaches the step of decoding received versions of the selected modulation symbols in a multilevel decoder (lines 1-3 of the abstract).

Regarding claim 23, Fazel teaches an apparatus for multilevel coding of a stream of information bits in a communication system, the apparatus comprising:

an multilevel encoder receiving a stream of information bits separated into a plurality of different portions (30 in Fig. 3), each of the portions of the information bits being associated with one of a plurality of levels (D_1, D_2, ... D_m in Fig. 3), the encoder being operative to apply at least one code (31_1, 31_2, ..., 31_M in Fig. 3) to the portion of the information bits of each level in a designated subset of the plurality of levels (D_1, D_2, ... D_M in Fig. 3), such that the portions of the information bits for one or more levels in the designated subset are coded while the portions of the information bits for one or more levels not in the designated subset (D_{M+1}, ..., D_m in Fig. 3) are uncoded; and

a modulator (32 in Fig. 3, col. 7, lines 29-33) having an input coupled to an output of the multilevel encoder, the modulator utilizing both the coded portions of the information bits and the uncoded portions of the information bits to select modulation symbols for transmission in the system.

Regarding claim 25, Fazel teaches a method for decoding of a multilevel coded stream of information bits in a communication system, the multilevel coded stream of information bits being coded by separating the stream of information bits into a plurality of different portions (30 in Fig. 3), associating each of the portions of the information bits with one of a plurality of levels (D_1, D_2, ... D_m in Fig. 3), and applying at least one code (31_1, 31_2, ..., 31_M in Fig. 3) to the portion of the information bits of each level in a designated subset of the plurality of levels (D_1, D_2, ... D_M in Fig. 3), such that the portions of the information bits for one or more levels in the designated subset are coded while the portions of the information bits for one or more levels not in the

designated subset (D_{M+1}, ..., D_m in Fig. 3) are uncoded, the method comprising the steps of:

demodulating (113 in Fig. 1B) received versions of the modulation symbols to obtain outputs

corresponding to each of the plurality of levels; and

decoding (112 in Fig. 1B) each of the outputs associated with a given level in the designated subset so as to obtain a received version of the corresponding portion of the information bits.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 5 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fazel et al. (U.S. Patent No. 5,323,424, "Fazel" hereinafter) in view of Herzberg (U.S. Patent No. 5,970,098) and Klayman et al. (U.S. Patent No. 5,841,378, "Klayman" hereinafter).

Regarding claim 5, Fazel teaches the claimed limitation (see the rationale applied to claim 1 above), but does not teach that at least one of the encoder 31_1-31_M

comprises a block coder concatenated with a convolutional coder. However, Herzberg teaches multilevel code may be made up of convolutional codes, block codes, or a combination of both (col. 4, lines 45-46). Klayman teaches a block code concatenated with a convolutional code will provide a better error correcting power (col. 2, lines 32-37). Since some bits in Fazel need more error correcting power than the others (col. 7, lines 22-23), it would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace at least one of the block encoders 31_1-31_M with a concatenated encoder, as taught by Herzberg and Klayman, so as to provide a better error protection.

Regarding claim 15, as applied above in claim 5, since at least one block encoders is replaced, the number of the concatenated encoders J_{max} inherently satisfies the relationship: $1 \leq J_{max} \leq i_{max}$.

6. Claims 9-13 and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fazel et al. (U.S. Patent No. 5,323,424, "Fazel" hereinafter).

Regarding claim 9-13, Fazel teaches the claimed limitation (see the rationale applied to claims 1 and 8 above), but does not specify the values of m and M (i.e., i_{max}). However, the values of m and M clearly are just a matter of design choices. The value of m is merely dependent on the type of modulation selected (e.g., 16-QAM, 32QAM etc., note that Fazel also teaches QAM, see col.4, line 24). The value of M merely depends on the number of bits that need to be coded for protection against noise. The values of m and M are therefore are design choices depends on the system constraint and requirement, and will not change the operation and principle of the method of

multilevel coding taught by Fazel. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to select any value for m (such as 4 or 5) and M (such as 2, 3, or 4) to meet the requirement of the system.

Regarding claims 20-22, Fazel teaches the claimed limitation (see the rationale applied to claim 1 above) including each of encoders 31_1-31_M has a code rate of $R_i = k_i/n_i$ (col. 6, lines 52), but does not specify the value of each code rate Ri and the overall code rate. However, the code arte is merely dependent on the parity or redundant bits that are added to the information bits to achieve a desired error correcting or protection performance, which is just a matter of design choice. The value of R_i will not change the operation and principle of the method of multilevel coding taught by Fazel. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to select any value for Ri such as the claimed values to achieve the desired error correcting or protection performance.

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fazel et al. (U.S. Patent No. 5,323,424, "Fazel" hereinafter) in view of Cloonan (U.S. Patent No. 5,566,193).

Fazel teaches the claimed limitation (see the rationale applied to claim 1 above), but does not specifically teach that the encoder 31_1-31_M are arranged to have increasing code rates from the encoder 31_1 to the encoder 31_M.

Cloonan teaches that a higher error detection rates requires more parity bits (col. 12, lines 24-25).

As Fazel teaches that the bit e_1 is most in need of protection, then e_2, etc. (see col. 7, lines 22-23) and each of the encoder E_1 (31_1 in Fig. 3) through E_M (31_M in Fig. 3) has the same length n (col. 6, line 62), it is clear E_1 has more parity bits ($n- k_1$) than E_2 ($n-k_2$), and E_2 has more parity bits than E_3 ($n-k_3$), etc. That is, $n-k_1 > n-k_2 > \ldots > n-k_M$, which in turn renders $k_1 < k_2 < \ldots < k_M$. Therefore, the relationship of the code rates is $k_1/n < k_2/n < \ldots < k_M/n$. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that the encoder 31_1-31_M should be arranged to have increasing code rates from the encoder 31_1 to the encoder 31_M, so as to provide the highest protection for the bit e_1, then e_2, etc.

8. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fazel et al. (U.S. Patent No. 5,323,424, "Fazel" hereinafter) in view of Chouly et al. (U.S. Patent No. 5,416,801, "Chouly" hereinafter).

Fazel teaches a method for multilevel coding of a stream of information bits in a communication system, the stream of information bits being separated into a plurality of different portions (30 in Fig. 3), each of the portions of the information bits being associated with one of a plurality of levels (D_1, D_2, ... D_m in Fig. 3), wherein the method comprises the steps of:

applying at least one code (31_1, 31_2, ..., 31_M in Fig. 3) to the portion of the information bits of each level in a designated subset of the plurality of levels (D_1, D_2, ... D_M in Fig. 3), such that the portions of the information bits for one or more levels in the

designated subset are coded while the portions of the information bits for one or more levels not in the designated subset (D_{M+1}, ..., D_m in Fig. 3) are uncoded;

utilizing both the coded portions of the information bits and the uncoded portions of the information bits to select modulation symbols (32 in Fig. 3, col. 7, lines 29-33) for transmission in the system.

Fazel does not particularly teach the steps are implemented in software. However, the use of software to implement a coding scheme for the advantage of flexibility is well known in the art. Chouly teaches program (col. 4, lines 22-30) a multilevel coding system (Figs. 1A and 1B, notice the similarity between Fig. 1 of Chouly and Fig. 1 of Fazel). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to implement the method of Fazel in software, so as to provide the flexibility of changing system parameters for various applications.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chieh M Fan whose telephone number is (703) 305-0198. The examiner can normally be reached on Monday-Friday 8:00AM-5:30PM, Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (703) 305-4714. The fax phone numbers

for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700.

Chieh M Fan
Primary Examiner
Art Unit 2634

cmf
March 21, 2004